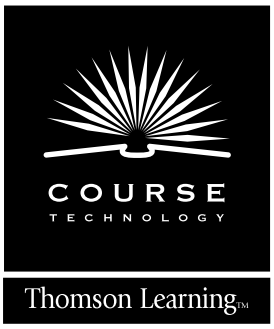
Guide to Linux® Installation and Administration

Nicholas Wells

with Michael Jang



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Preface

The growth of Linux as an accepted and widely used operating system is the most important event to occur in the computer industry since the rise of the Internet. Many new Linux-focused companies are appearing, and most major hardware and software vendors are now moving rapidly to support Linux. Thus, it's essential that computer professionals become familiar with Linux technologies and applications. This book guides you through the process of learning Linux. It begins by introducing many basic concepts that may be unfamiliar to you and then explains the installation and use of a Linux-based computer from the point of view of a system administrator.

After you have become familiar with the tools and processes related to installing and administering a Linux system, you may need to demonstrate that knowledge by passing a Linux certification exam. After all, organizations are increasingly relying on such exams as a means of assessing technical skills. The world of Linux professional certification is still fairly new. As of this writing, two high-quality certification programs are available: the Linux Professional Institute (LPI) certification (see *www.lpi.org*) and the Sair & GNU Linux certification, called LCA, for Linux Certified Administrator (see *www.linuxcertification.org*).

LPI is sponsored by numerous major Linux vendors, including Caldera Systems, LinuxCare, and SuSE Linux. It is a nonprofit organization that operates with a board of directors who gather input from members of the Linux community to develop overall certification goals, testing objectives, and future plans. LPI has planned a three-level certification program. The first level, addressed by this book, consists of two tests aimed at basic Linux proficiency. One of these tests is a vendor-specific test and allows you to focus your training efforts on the Linux product that you expect to use most, such as Red Hat Linux, TurboLinux, Debian Linux, or others.

The Sair & GNU Linux certification effort was started by Tobin Maginnis, a professor at the University of Mississippi. With cooperation from leading free software enthusiasts, his organization created the LCA testing objectives and testing program. To obtain LCA certification, you must pass a series of four tests. The first two of these tests are addressed by this book. The third and fourth LCA exams are covered in *Guide to Linux Networking and Security,* (ISBN 0-619-00094-5), also published by Course Technology. The Sair & GNU Linux program is entirely vendor neutral, though it tends to focus somewhat on the Debian distribution.

Appendix A provides the most current information about the LPI and LCA certification objectives available at this writing. Both the LPI and LCA certification programs require you

to take and pass multiple tests. To prepare for the LPI tests, you should master the material presented in this book and also in the companion book *Guide to Linux Networking and Security*. To prepare for the first two LCA tests, use this book; to prepare for the third and fourth LCA tests, use the companion book.

The chapters in this book discuss the following topics:

Chapter 1 introduces the term OpenSource as it applies to the Linux operating system and describes the history of the Linux project.

Chapters 2 and 3 help you compile the hardware information you need in order to install Linux. They explain concepts related to installation and then walk you through the process of installing Linux on a computer.

Chapter 4 introduces many concepts related to how a Linux operating system functions. It explains how to work at the command line and how the system is initialized. It also introduces essential Linux commands.

Chapter 5 presents the Linux graphical systems in detail, explaining how to configure and troubleshoot the graphical environment.

Chapter 6 includes more information about using the shell, or command-line environment, to complete work in Linux.

Chapter 7 introduces Linux system administration. It describes the work of a system administrator, some concepts that Linux system administrators should know, and a few key system administration commands.

Chapter 8 focuses on three key areas of Linux system administration: managing user accounts, managing file systems, and managing processes (programs).

Chapter 9 describes how to safeguard information on a Linux-based computer against hardware failure. It explains concepts such as redundancy and introduces you to the Linux tools you can use to protect your data.

Chapter 10 explains how to manage the performance of a Linux-based computer using standard Linux command-line and graphical utilities. It explains how to expand the file system, manage memory, and work with benchmarks to track system performance.

Chapter 11 is dedicated to system logging. It teaches you why logs are important, where they are located, and how you can use the information they contain to manage a Linux system.

Chapter 12 explains how to write scripts in Linux and then use those scripts to schedule tasks for execution at any time.

Chapter 13 focuses on printing from a Linux system. You learn about the printing system in general, the utilities used to print files and manage printers, and how to print to network-accessible printers.

Chapter 14 explains how to back up data using standard Linux utilities and popular hardware devices such as optical drives and tape drives.

The three appendices at the end of this book serve as references for the Linux professional. Appendix A provides a list of the certification objectives for the LPI and LCA certification programs. Review these

objectives to test your knowledge and readiness before attempting to pass the certification exams. Be sure to check the Web sites mentioned earlier in the Preface to ensure you are using the most current certification objectives. Appendix B and Appendix C contain reference information about Linux command-line utilities and Linux graphical administration tools, respectively.

THE INTENDED AUDIENCE

This book is intended to serve the needs of readers who plan to work as Linux system administrators and who may also plan to take one or more certification tests as part of their professional preparation. The text and pedagogical features are designed to provide a truly interactive learning experience, preparing you for the challenges of the dynamic Linux industry. In addition to the information presented in the text, each chapter includes hands-on projects that take you through various tasks step by step. Each chapter also contains case projects that summarize a real-life situation in which you must use the knowledge gained in the chapter to address a specific problem.

FEATURES

To aid you in fully understanding the concepts related to Linux installation and system administration, this book includes the following features:

- **Chapter Objectives.** Each chapter in this book begins with a detailed list of the concepts or procedures to be mastered within that chapter. This list provides you with a quick reference to the contents of that chapter, as well as a useful study aid.
- **Illustrations and Tables.** Numerous figures of utility screens and conceptual diagrams help you visualize Linux tools and concepts. In addition, many tables provide detailed utility information, summaries of options, or comparisons of both practical and theoretical information.
- **Chapter Summaries.** Each chapter's text is followed by a summary of the concepts and tools introduced in the chapter. These summaries provide a helpful way to recap and revisit the ideas covered in each chapter.
- **Key Terms.** All of the terms within the chapter that were introduced with boldfaced text are gathered together in the Key Terms list at the end of the chapter. This provides you with a method of checking your understanding of all the terms introduced.
- **Review Questions.** End-of-chapter assessment begins with a set of review questions that reinforce the ideas introduced in each chapter. These questions are written to ensure that you have mastered the concepts presented.
- **Hands-on Projects.** Although it is important to understand the concepts behind the Linux operating system, nothing can match the value of real-world experience. To this end, each chapter provides hands-on projects aimed at providing you with a step-by-step guide to implementing real-world solutions.
- **Case Projects.** Located at the end of each chapter are several case-oriented questions. In answering these questions, you must describe how you would use the skills and knowledge gained in the chapter in real design and implementation scenarios.

TEXT AND GRAPHIC CONVENTIONS

Wherever appropriate, additional information and exercises have been added to this book to help you better understand what is being discussed in the chapter. Icons throughout the text alert you to additional materials. The icons used in this textbook are described below.

The Tip icon is used to present additional helpful material related to the subject being described. Many of the tips are drawn from the author's experience to help you better understand the concept or utility being described.

Each hands-on activity in this book is preceded by the Hands-On icon and a description of the exercise that follows.

The cautions are included to help you anticipate potential mistakes or problems so you can prevent them from happening.

RED HAT 6.0 CD

This book includes a copy of the Publisher's Edition of Red Hat Linux from Red Hat, Inc., which you may use in accordance with the license agreements accompanying the software. The Official Red Hat Linux, which you may purchase from Red Hat, includes the complete Official Red Hat Linux distribution, Red Hat's documentation, and may include technical support for Official Red Hat Linux. You also may purchase technical support from Red Hat. You may purchase Official Red Hat Linux and technical support from Red Hat Software through the company's web site (*www.redhat.com*) or its toll-free number 1-888-REDHAT1.

SYSTEM REQUIREMENTS

To install Red Hat Linux 6, your computer must meet the following minimum requirements:

- Intel 486 processor
- 16 MB of RAM
- 500 MB free hard disk space
- 3.5-inch floppy drive
- CD-ROM drive

To access a Linux host on a local area network to which your computer is connected, you need the following software and information:

- Telnet program
- Either the IP address or the host and domain name of the Linux system

To access a Linux host via the Internet, you need the following software and information:

- Dial-up connection to an Internet Service Provider
- Telnet program
- Either the IP address or the host and domain name of the Linux system

INSTRUCTORS' MATERIALS

The following supplemental materials are available when this book is used in a classroom setting. All of the supplements available with this book are provided to the instructor on a single CD-ROM.

Electronic Instructor's Manual. The instructor's manual that accompanies this textbook includes:

- Additional instructional material to assist in class preparation, including suggestions for lecture topics, suggested lab activities, and sample syllabi.
- Solutions to all end-of-chapter materials, including the hands-on projects and case projects.

Course Test Manager 1.3. Accompanying this book is a powerful assessment tool known as the Course Test Manager. Designed by Course Technology, this cutting-edge, Windows-based testing software helps instructors design and administer tests and pretests. In addition to generating tests that can be printed and administered, this full-featured program has an online testing component that allows students to take tests at the computer and have their exams automatically graded.

PowerPoint Presentations. A complete set of Microsoft PowerPoint slides is available for each chapter. These can be used as a teaching aid for classroom presentation, as an online resource for chapter review, or as printed material for classroom distribution. Instructors are at liberty to add their own slides for additional topics introduced to the class.

DEDICATION

This book is dedicated to my favorite teacher, Quentin sT. Wells. Thanks, Dad.

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Preparing a book of this type requires the cooperation and coordination of many talented people. I felt privileged to work with them in creating this book together. Stephen Solomon at Course Technology started me on the road to this project and acted as a guide in the rapidly evolving world of Linux certification. Lisa Egan kept me on track during the many revisions and reviews required to prepare a book that we can all be proud of. She handled her job with humor and aplomb. A special thank-you is due to Ann Shaffer, the book's development editor, who showed me by her attentive and professional efforts that the craft of writing need not be diminished even when working in a fast-moving technical field. I trust that each reader will benefit from her attention as much as I did. Many other people at Course Technology contributed to the review, testing, and layout of this book, including Lisa Auer, the Production Editor, John Bosco, Manuscript Quality Assurance Manager, and the other members of the testing team. Other reviewers located around the country were willing to spend time reviewing the book before it was in a usable state. I thank all of these individuals for their patience and assistance:

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Those who are working to make Linux certification a powerful force for professional training and acceptance of Linux in large organizations deserve the thanks of everyone who works professionally with Linux. Dan York and others on the board of the Linux Professional Institute, and Tobin Maginnis, who founded the Sair & GNU Linux certification effort (now owned by Wave Technologies), both deserve mention.

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